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Coupaud, Sylvie and McLean, Alan N. and Allan, David B. (2012) *Early identification of patients with rapid bone loss following spinal cord injury, using peripheral Quantitative Computed Tomography (pQCT)*. Osteoporosis International, 23 (Issue). S179-S180. ISSN 0937-941X

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Early identification of patients with rapid bone loss following spinal cord injury

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Objectives: We are developing bone densitometry protocols to identify patients with significant bone loss early after spinal cord injury (SCI), to enable targeted treatment against osteoporosis. Fragility fracture rates in the paralysed limbs are high [1] at the trabecular-rich sites that show the most rapid and extensive bone loss after SCI [2,3].

Material & Methods: Inpatients of the Queen Elizabeth National Spinal Injuries Unit (Glasgow, UK) with motor-complete SCI at neurological levels C4 and below are scanned using peripheral Quantitative Computed Tomography (pQCT) within 5 weeks of injury (Baseline), and again at 4, 8 and 12 months post-SCI. Total Bone Mineral Density (BMDtot), trabecular BMD (BMDtrab) and bone mineral content (BMC) are calculated from unilateral scans at both epiphyses of the tibia, and the distal epiphyses of the femur and radius.

Results: Data are presented from 13 subjects: 8 paraplegia / 5 tetraplegia, all male, aged 17-72 years old. At baseline, mean (SD) BMDtot was 345.70 (24.42), 263.10 (33.21) and 293.10 (24.92) mg/cm³ in the distal tibia, proximal tibia and distal femur, respectively. By 8 months post-injury, BMDtot had fallen to 293.59 (53.34), 202.36 (46.30) and 247.94 (39.72), respectively. Further regression analyses revealed some subjects with statistically significant decreases in BMD and BMC in the paralysed limbs ("FAST" bone losers), others with little/no bone loss ("SLOW" bone losers).

Conclusions: Repeat pQCT bone scans within the first year of SCI enable us to red-flag "FAST" bone losers, providing a window of opportunity to apply preventative treatments against further bone loss in vulnerable patients. These data will inform osteoporosis management in SCI and other patient groups.

References: [1] Vestergaard P. *et al.* (1998) *Spinal Cord* 36(11): 790-796; [2] Morse L. *et al.* (2009) *Osteoporos Int* 20: 385-392; [3] Eser P. *et al.* (2005) *Arch Phys Med Rehabil* 86: 498-504.